

# Restoration of the Wiswall Bridge, Durham, NH:

## A Cooperative Effort of Community Recovery

Lydia Kachadoorian & Dr. Peter Thomas

FEMA Region 1, Environmental & Historic Preservation Office

October 28, 2016



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
Partners in shaping resilient communities

# Impacts of Severe Storms & Flooding



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES

## FEMA Funding for Community Recovery Following a Presidential Disaster Declaration, 2000 – 2016

State	No. of Presidential Declarations	Total Funding from FEMA – Public Assistance (2000-2016)
<i>New Hampshire</i>	18	\$ 125,678,182
<i>Maine</i>	19	\$ 81,387,610
<i>Vermont</i>	23	\$ 281,499,754 (75% for TS Irene)
<i>Massachusetts</i>	14	\$ 418,407,863
<i>Connecticut</i>	9	\$ 270,265,414
<i>Rhode Island</i>	6	\$ 50,692,334
<i>New England total</i>	89	\$ 1,227,931,157
<i>Louisiana</i>	19	\$ 7,448,469,988



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## NH Section 106 Programmatic Agreement

- Applicability, Roles & Responsibilities, and Timelines
- Coordination Following Declaration of a Disaster
- Methods of Project Review
- Resolution of Adverse Effects
- Unexpected Discoveries & Anticipatory Actions
- Scope Changes
- Public Participation
- Duration and Extension



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## A CASE STUDY

The Mother's Day Storm of May 2006  
produced heavy rains and led to  
widespread flooding in southern  
New Hampshire



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## Location of Wiswall Bridge



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## 2013 Google Earth Image



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES

## Floodwaters Overtopped Bridge & Center Support Pier



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## Sink Hole in Supporting Pier Exposed Concrete Lintel



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES

## Taken After Floodwaters Receded – July 23, 2006



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES

## Guardrail Damage



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## Wiswall Bridge is a Composite Bridge – East Span



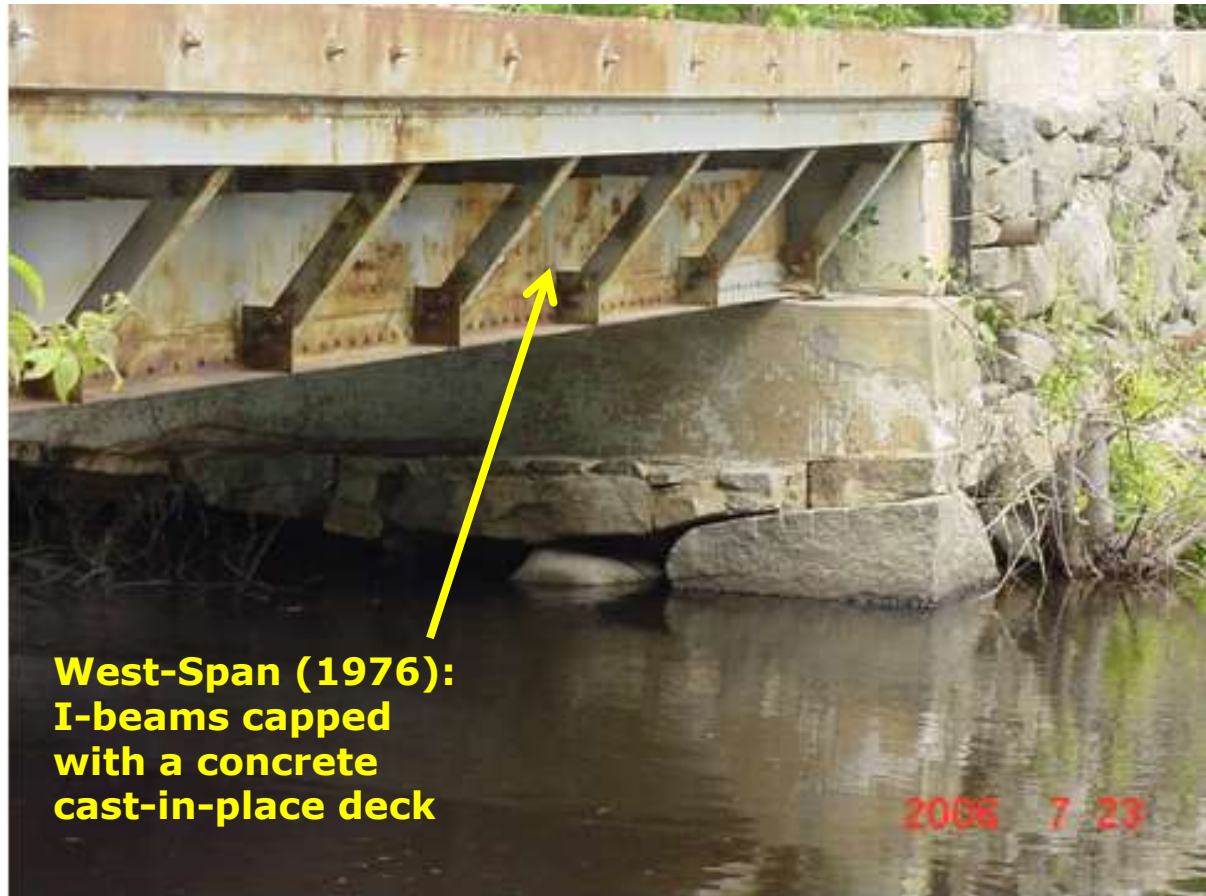
**East Span (1950):  
I-beams supporting  
a corrugated steel  
deck**



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES

## Wiswall Bridge is a Composite Bridge – West Span



**West-Span (1976):  
I-beams capped  
with a concrete  
cast-in-place deck**



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES

## Massive 19<sup>th</sup> Century Stone Abutments



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES





## Initial Scope of FEMA Funding - 2006

- Labor & equipment to barricade the bridge.
- Installation of a 150-foot reinforced Bailey bridge over the top of the existing bridges on the same alignment.
- Installation of ~75 feet of paved approach at each end of the Bailey bridge.
- Engineering services related to restoration of the bridge to its “pre-disaster” condition.



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## Two Unknown Variables - 2006

- Replacement or Upgrade
  - “In-kind” replacement using 75% FEMA funds/25% Town funds
  - Upgrade using a combination of FEMA funds & supplemental funds from NHDOT Municipally Managed Bridge Aid Program
- Boundaries - Possible expansion of the Wiswall Falls Mill Site 1988 National Register Historic District boundaries



FEMA

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES

## Bailey Bridge in Place for 2 Years During Planning



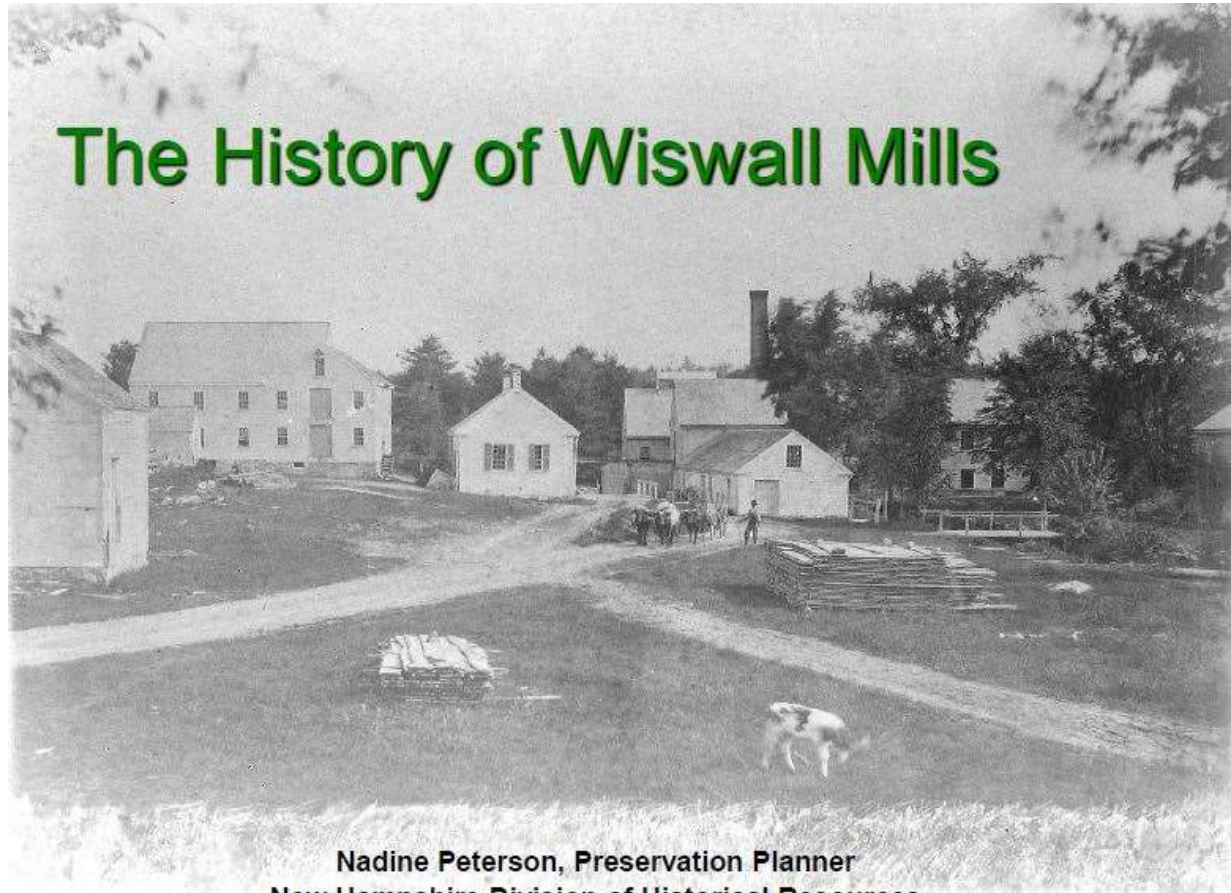
**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



# Early Mill Complex

## The History of Wiswall Mills



Wiswall dam buildings

Nadine Peterson, Preservation Planner  
New Hampshire Division of Historical Resources

Durham Historic Association



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES

## Mill Dam and Worker Housing

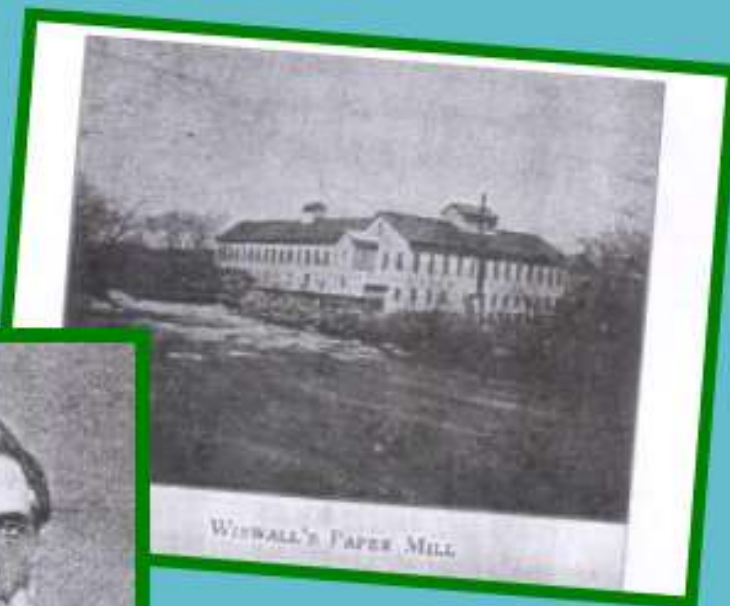


**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



# Height of Prosperity: T.H. Wiswall & Company Mills



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## Mill Sluiceway



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



# Stonework Restored Through NPS - Wild & Scenic Rivers Program Funding



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## Town Decision – 2008

- Pursue an “improved project” using both FEMA and NHDOT funding.
- Preliminary engineering study demonstrated re-use of existing historic bridge abutments was not practical or cost-effective.
- Replace two span bridge with a single 108-foot-span bridge using precast concrete box beams placed on new concrete abutments in the same location as the existing abutments.
- Critical to remove central pier to alleviate debris accumulation issues.
- Slightly raised bridge deck designed to be more flood resilient.



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES





## Section 106 Consulting Parties – 2008 & 2009

- FEMA
- NHDHR/SHPO
- HSEM
- NHDOT
- NPS (Wild & Scenic Rivers Program)
- Town of Durham



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## Public Outreach & Engagement - 2008 & 2009

- Section 106 Evening Public Meeting
  - Consulting Parties (FEMA, NHDHR, Town, etc.)
  - Lamprey Rivers Advisory Committee
  - Wild and Scenic Subcommittee
  - Lamprey River Watershed Association
  - Durham Historic Association
  - Private Citizens
- NH DHR Public Presentation – Nadine Miller
- Town Hall Meetings & Public Votes



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



# Memorandum of Agreement – Executed 2009

## Mitigation Plan

- Structural Elements of New Bridge (West Abutment & Wing-Wall)
- Expanded Boundaries & Revised Historic District Registration Form
- Public Outreach & Interpretive Exhibit
  - Wiswall Historic Interpretation Committee
    - » 8 citizens & Town Engineer



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## Structural Elements - Stone Façade - 2010



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES

## New Bridge With Stone Façade – 2010/2016



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



# Structural Engineering Excellence Award - 2011



## WISWALL BRIDGE REPLACEMENT Durham, NH

### CLIENT

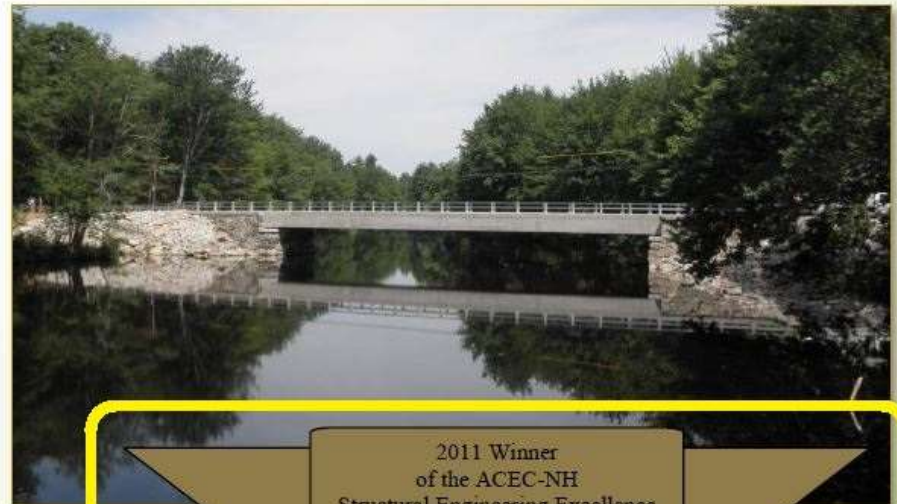
Town of Durham  
100 Stone Quarry Drive  
Durham, NH 03824  
(603) 868-5578  
Contact: David Cedarholm,  
Town Engineer

### COST

\$1.3 Million

### PROJECT COMPLETION

June 2010



2011 Winner  
of the ACEC-NH  
Structural Engineering Excellence  
Award



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## National Register Historic District - Wiswall Residence



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES

# National Register Historic District -Mill Worker Housing



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## Interpretive Exhibit



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## THE WISWALL ERA: 1853-1883



The Wiswall era  
1870s

### A Heart of Durham's Economic Life

The T.H. Wiswall Paper Company was one of thirty-four paper mills in New Hampshire, and one of only two that made wallpaper. At its peak, Wiswall's wallpaper mill employed ten men and five women. The machinery ran eleven hours a day all year long. The sawmill also continued to operate. The site was a toby, bustling place and one of Durham's biggest employers. Employees worked hard but had a good life by the standards of the day.

### Life in a Mill Community

Wiswall's mill complex and the nearby town formed a self-sufficient village. In the 1870s, the town was built around the mill. The mill community was a self-contained village in the heart of the town. The mill community was a self-contained village in the heart of the town. The mill community was a self-contained village in the heart of the town.



in Wiswall



in Wiswall



in Wiswall



in Wiswall



in Wiswall



in Wiswall



in Wiswall



in Wiswall



in Wiswall



in Wiswall

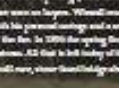
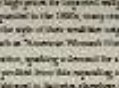


in Wiswall



### Paper Production at Wiswall

Making paper was a difficult, old process. The mill used a water wheel to power the machinery. The mill used a water wheel to power the machinery. The mill used a water wheel to power the machinery.



This illustration reconstructed from a computer analysis of foundations found on the site shows the probable location of the mill buildings, the dam, and canal in the 1870s.

You are here

© 2014 NH State Dept. of Heritage



### The End of an Era

On November 1, 1883, the last day of the mill. The mill was closed down. The mill was closed down. The mill was closed down. The mill was closed down. The mill was closed down.

To find out more about the mill, visit the site at [www.wiswall.com](http://www.wiswall.com). The site is located in Durham, New Hampshire. The site is located in Durham, New Hampshire. The site is located in Durham, New Hampshire.



FEMA


OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES





**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



# SECTION 106 CONSULTATION PRODUCES POSITIVE RESULTS, BUT SOME OUTCOMES ARE UNEXPECTED



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## Dangerous fun: Signs warning of rocks at popular Durham diving spot



HIDE CAPTION

John Huff Staff photographer Oyster River senior Andres Belsid, left, swims off Wiswell bridge in Durham with her friend Rhys Huntley on a recent warm summer day.



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## Lamprey Rivers Advisory Committee –Resources

- Wiswall's Mill: A Short History
- River Story: The Lamprey River through History
- Reflections on a River: 30 Years of Protecting the Lamprey River
- Connecting Lives on the Lamprey River

<http://www.lampreyriver.org/>



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES



## QUESTIONS?

**Lydia Kachadoorian, RPA**

FEMA Region I - Deputy Regional Environmental Officer

Email: [Lydia.Kachadoorian@fema.dhs.gov](mailto:Lydia.Kachadoorian@fema.dhs.gov)

Cell: 857-205-2860

**Dr. Peter Thomas**

FEMA Reservist - Environmental & Historic Preservation Advisor

Email: [pthomas@gmavt.net](mailto:pthomas@gmavt.net)

Cell: 202-320-7431



**FEMA**

OFFICE OF ENVIRONMENTAL PLANNING AND HISTORIC PRESERVATION  
PARTNERS IN SHAPING RESILIENT COMMUNITIES